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ABSTRACT

Boys, aged 6-10 in regular classes, who were judged as hyperactive by their teachers were compared with matched non-hyperkinetic boys in terms of family background information and neurological functioning. Parent interview data were obtained on 109 hyperkinetic and 135 control Ss, while 121 hyperkinetic and 142 control Ss underwent pediatric neurological examinations. Parent interview data gathered included medical history, prenatal experiences of mother, the S's infant and preschool behavior, and socioeconomic status (SES). Although significant differences between groups were found on the neurological examination, there was a relatively low absolute incidence of neurological pathology and it was of a diffuse nature, consisting primarily of soft signs. This was seen to suggest immature psycho-physiological status, or developmental lag. Low SES was associated with hyperactivity in older (8-10 year old) hyperactive Ss; disturbance in the family situation was present more often in hyperactive than in control S's families; low SES and high family disruption scores were related within the hyperkinetic group. Findings suggested that social and environmental factors become more relevant to hyperactive behavior as age increases. (KW)

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The Relationship of Family Background and Neurological Status to Hyperactivity in a Normal Class Setting

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Background

This research project represents an attempt at examining a group which presents significant problems to educators of pre-adolescent children. The group under discussion are hyperkinetic, distractable and impulsive children. Reasons for such behavior, in any single instance, could relate to genetic predispositions, psychological and/or physical immaturity, neurological dysfunction, emotional disturbance, environmental deprivation, teacher-student or student-student incompatibility or, conceivably, all or any combination of the above. Certainly no similar group of children possess the potential for exerting as intense a negative influence in the normal classroom. A single such child in a classroom of average size not only fails to learn up to his potential, but can also interfere with the educational experience of the remainder of the class. Further, an atmosphere of rejection and hostility directed toward such children, by both peers and adults, frequently can develop. Such development tends to lower self-esteem and motivation to both learn and achieve. Thus, an adequate educational adjustment becomes increasingly more unlikely.

The general focus of the research project was to derive a better understanding of the hyperkinetic child from a functional viewpoint. Specifically, the two major aims of the study were: (1) to identify reliable differences between pre-adolescent boys who were seen as demonstrating a hyperactive behavior syndrome, and boys not so seen; and, (2) to look for sub-groups of hyperactive children which are relevant educationally.

Generally then, the research was concerned with an extensive study of pre-adolescent boys in normal public school classes who were judged as hyperactive

by their teachers. The dimensions of the project were extremely broad and included the following eight variable categories:

1. Standardized and clinical tests.
2. Experimental mental ability measures.
3. Experimental personality measures.
4. Teacher's ratings.
5. Teacher's rankings.
6. Sociometrics.
7. Neurological examinations.
8. Parent interviews.

The relationship of the two-letter variables to hyperkinesis will be the focus of the present presentation. That only two of the eight categories of data will be presented is a reflection of the fact that a total discussion would make for an extremely cumbersome presentation. Further, the parent interview and neurological results seem to compliment each other and, in a sense, adds new information about a population of hyperactive children in regular classes.

Methodology

Subject Selection

Hyperkinetic and Control Group subjects were selected on the basis of the degree to which they were perceived by their teachers to exhibit classroom behavior making up a hyperactive behavior syndrome. Specifically, teachers in Grades K through 6 were asked to rate all of the children in their classes as to the incidence of five behaviors: hyperactivity, distractability, impulsivity, unpredictability, and explosiveness. A six-point scale was utilized for each behavior, ranging from "very frequent or constant" to "very rare or never." The teachers were also asked to take the age of the child into account; that is, to rate the incidence of a particular behavior in reference to what would be expected

in reference to what would be expected on the basis of the chronological age of the child. The five criterion behaviors were selected because they were found to be the terms most frequently chosen as descriptive of hyperkinetic behavior syndrome the literature (Bender, 1951; Eisenberg, 1957; and Laufer and Denhoff, 1957). The particular rating instrument was originally developed for use in a research on differences in visual perception between hyperactive and hypoactive neurologically-disturbed and normal pre-adolescent boys (Finneran, 1964). Since the rating scale instrument was made up of five six-point scales, potential total rating scores ranged from 5 to 0, inclusive. Boys were selected for potential inclusion in the Hyperkinetic Group if their mean rating score on the five sub-scales was four or above; that is, if they received a total rating scale score of at least 20 out of a possible 30. Hyperkinetic subjects were chosen first; Control subjects were matched with them within three months of age and were further restricted to those boys who received no individual sub-scale scores of greater than three, or a total score of not greater than fifteen. Further, whenever possible, Hyperkinetic-Control mates were members of the same class. Two Control subjects were matched with each Hyperkinetic subject to increase the probability of the existence of as many intact pairs as possible after parental permission had been obtained. The original teacher's ratings were carried out by almost all elementary school teachers in Grades K through 6 in the Kingston, N.Y. Consolidated School District. These ratings yielded data on a total of 5434 children: 2832 boys and 2602 girls. It was from the pool of 2832 boys that the Hyperkinetic subjects were chosen. In the study, only boys were included because they presented more of a problem in the classroom in terms of hyperactivity, as documented by

the fact that they were consistently rated higher than girls for all five of the hyperkinetic dimensions at all age levels.

Naturally, for the purpose of study, the reliability and stability of the teacher's ratings were critical. Test, re-test reliability proved adequate (median r = .849). Moderate stability for the boys was observed over a one-year test period (male median r = .558). Therefore, these data on reliability and stability suggested that the defined Hyperkinetic Group would show sufficient consistency to allow for further study. Further, when teacher's ratings ere compared with research assistant's ratings, and parent's ratings on the same children using the same scales, statistically significant agreement was noted.

Subjects were selected at five age levels (6 to 10 years). Within each age level there were two groups - a Hyperkinetic Group and a Control Group. In terms of number of subjects, parent interview data was obtained on 244 boys (109 Hyperkinetic and 135 Controls). Two Hundred Sixty-three boys submitted to pediatric neurological examinations. This total included 121 Hyperkinetic and 142 Controls.

Parent Interviews Schedule

Parent interviews were conducted by employing a structured interview procedure. The focus was on medical history, unusual experiences of the mother prior to birth, recalled behavior of the child during infancy and pre-school years. Also included were items of a socio-economic nature, as well as parent's ratings of current behavior. The latter was analogous to the teacher's rating mentioned above. A total of 166 measures were derived from

the parent interviews. Further, all interviews were conducted in the parent's home by a trained sociologist.

Neurological Examination

The neurological was administered by a physician in the child's school. The procedure consisted of 77 items, each of which could be categorized as "normal" or "pathological." For the purpose of analysis, the 77 items were divided into three sections - the first consisted of 11 items asked the child directly, concerning his experiences and self-perception. The second section was made up of 56 items which assessed neurological functioning. These included sections on facial nerve functioning, large muscle function, sensations, coordination, reflexes and gait. The third section consisted of 10 items of a general pediatric nature; for example, conventional heart and lung examinations.

Results

Parent Interviews

To analyze the parent interview data, each item was compared for Hyperkinetic and Control Group subjects. Generally, 2 x 2 Chi Squares analyses were utilized. The technique was appropriate because either a particular variable was initially set up as a dichotomy, or because the initial multiple category system was found to be too sensitive for the data, resulting in a very low numbers in some of the categories. In these cases, categories were collapsed to provide dichotomous data without serious loss of information. Even so, many variables provided categories which contained a relatively low proportion of both Hyperkinetic and Control children. It should be noted that certain variables provided continuous data; in these cases, *t* tests were employed for Hyperkinetic-

Control comparison.

Statistically significant differences between the Hyperkinetic and Control Groups were found with respect to certain background variables obtained from the parent interview. The most important such findings are the following six:

1. A larger proportion of older (ages 8 to 10 years) hyperactive children were found to come from the lower two socio-economic levels as defined by Hollingshead (1957). This finding is in the context of a larger proportion of children from those two lower social levels in the older age groups in both the Hyperkinetic and Control categories.

2. A larger proportion of Hyperkinetic children demonstrated a constellation of factors associated with the presence of disturbance or disruption in the family situation (FD Index) at all age levels.

3. A larger proportion of Hyperkinetic children were observed by their parents to show behavioral problems relatively early in their life history.

4. A larger proportion of Hyperkinetic children were judged to have problems of both a behavioral and an academic nature in school, which became apparent early in their school careers.

5. Within the Hyperkinetic Group a significant relationship between socio-economic status and family disruption was found. The relationship was that a larger proportion of children showing high family disruption scores (3 or greater on an eight-point scale) came from the two lower socio-economic

levels. This relationship was most evident at the younger age levels where subjects with high family disruption indices coming from upper socio-economic levels were virtually absent.

6. With the exception of the necessity of oxygen administration at birth, where the Hyperkinetic children were more highly represented, there were no significant differences in the proportion of Hyperkinetic compared to Control children, in terms of medical history variables. However, it should be noted that the total number of studies' children receiving oxygen treatment was very small (5 percent).

Neurological Examination

Statistically significant differences between the Hyperkinetic and Control children were also found on the neurological examination. The most salient of these findings are presented below:

1. A larger proportion of Hyperkinetic children demonstrated pathology in response to four questions relating to abnormal feelings or experiences, such as dizzy spells, trouble with vision, and peculiar sensations. Somewhat unexpectedly, a significantly larger proportion of Control children reported experiencing headaches.

2. A larger proportion of Hyperkinetic children were judged to evidence pathology on neurological items relating to bi-lateral symmetry, strength of various muscle groups, extra ocular movement, and the carrying out of simple commands to touch certain parts of the body with the digits. These differences were particularly evident and statistically significant only in the two younger

age groups (6 and 7 year olds).

3. As noted previously, a larger proportion of Hyperkinetic Children were judged by the examining physician as hyperactive, distractable, and as dawdlers in dressing. This effect was particularly evident at the older age levels evaluated (9 and 10 year olds).

4. There was a trend, as with family disturbance, for age-controlled above median pathology on the neurological examination proper to relate to socio-economic level in the Hyperkinetic Group. Specifically, the finding was for the presence of such pathology to be more associated with lower socio-economic status. It was found to be statistically significant, however, only among the older age group. Further, family disturbance and neurological pathology were found to be unrelated to each other in the Hyperkinetic Group at either the younger or older age levels.

5. When the incidence of individual pathological signs from the neurological examination proper were compared by rank order correlation for Hyperkinetic and Control children, a positive and statistically significant correlation coefficient was obtained ($r = .731$). This finding suggests that the pattern of neurological sign incidence in both the Hyperkinetic and Control Groups was statistically similar.

6. Finally, the generally low incidence of pathology uncovered by the neurological examination procedures should be stressed. While significant Hyperkinetic-Control Group differences were demonstrated, considerable overlap between the two groups remained. This sizeable proportion was 25 percent

of the total hyperkinetic population. Further, in a considerable proportion of the Hyperkinetic Group, no judgment of neurological pathology was made from the neurological examination proper.

Interpretation and Conclusions

When the results of parent interviews and neurological examinations are taken together, it would seem that the usual sequela of neurological damage; for example, high fevers, convulsions, pre-natal and birth difficulties, were not associated with hyperkinesis in the present study. Rather, the significant concomitance appear to be mildly related to social deprivation or disorganization, and are particularly evident at the older age levels (9 to 10 years). Significant difficulties in inter-personal interaction are also related, but could be the result as well as a cause of the disorganized behavior. At any rate, although socially-related factors do seem to contribute significantly to hyperactive behavior, a substantial number of Hyperkinetic children had either low family disturbance indices (58 percent), and/or came from high socio-economic levels (34 percent). A major reason for this significance of the difference between the Hyperkinetic and Control Groups on the family disturbance measure, was that only 11 percent of Control children had high family disruption scores.

At the younger age levels where the Hyperkinetic and Control Groups were found to differ significantly as to neurological results; neurological pathology and socio-economic level were not found to be significantly related. However, at the older age levels only two out of the twenty-one Hyperkinetic children showing above median nuerological pathology came from the highest three socio-economic levels. This same trend can be observed in the Control Groups as well.

At the younger age levels, then, neurological pathology was associated with hyperkinesis but not with socio-economic status. At older age levels, such pathology (generally at a very low absolute level) was associated with socio-economic status, but not with hyperactivity. Further, it will be remembered that socio-economic status is significantly associated with hyperactivity of the older but not the younger age levels. At the younger age levels, then, the Hyperkinetic Group includes a sub-group of high socio-economic children with above median neurological pathology scores, which is not present at the older age levels. At the older age levels, a sub-group of high socio-economic high family disruptive children are found which was not present in younger age levels.

These findings suggest that social and environmental factors become more relevant to the hyperactive behavior of the older age levels of this study (9 and 10 years). The above findings also suggest that the meaning of neurological pathology, as measured by these procedures in the normal school setting is equivocal and subject to a variety of interpretations. One possibility is to structure such "pathology" in developmental terms, as being associated with the relative immaturity or of slower development of psycho-physiological organization, rather than as indicating neurological dysfunction in the classical sense. The findings supporting this interpretation include:

1. The relatively low absolute incidence of observed neurological pathology.

2. The diffuse nature of pathology; recognizable symtom patterns were noticeably absent. The observed pathology consisted primarily of the so-called "soft signs."

3. The decrease in pathological sign incidence with increase in age in both the Hyperkinetic and Control children.

4. The statistically significant similarity in the pattern of pathological sign incidence in the Hyperkinetic and Control Groups.

5. The lack of indications in the histories of the Hyperkinetic children of the usual antecedent conditions of brain damage (such as trauma, fever, pre-natal difficulties).

Further, if the neurological pathology found in this study was indeed indicative of brain damage in the classical sense, increasingly smaller proportions of children demonstrating such pathology at high age levels would be expected. This would be attributed to the growing likelihood of their being placed in special educational settings as their pathology became increasingly more detrimental to adequate scholastic fundtioning. Attrition of both Hyperkinetic and Control children with high neurological pathology scores was not found to be higher than that of the other children.

Moreover, one might expect that hyperactivity associated with neurological pathology would be more reliable and stable over time, as compared to that without such associated pathology. Such was not found to be the case; approximately two-thirds of both the neurological and non-neurological sub-groups of Hyperkinetic children had at least one subsequent total re-rating scale score at or above the cut-off point of 20. This same portion generally held among an extreme group of children having more neurological pathological signs (equal or greater than eight) than any Control Group child. The weight of evidence, then, would seem to be on the side of an interpretation of the observed neurological pathology as indicative of relatively immature psycho-physiological status.

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